

EXPONENTIAL GROWTH AND DECAY

Suppose that a culture of bacteria has an initial population of 1000 cells, and grows at a rate proportional to its size. After one hour, the population has increased to a size of 420.

- Let $P(t)$ denote the population of bacteria at time t where t is measure in hours. Let $P_0 = P(0)$. What is P_0 ?
- Write an equation representing the statement "...grows at a rate proportional to its size..." (this should involve P , dP/dT , and some constant.
- Write down an initial value problem, using the solutions from the previous parts, that models this problem.
- Solve the initial value problem to find a function $P(t)$ satisfying the initial value problem that you set up in your solution to the previous question. Verify that the function actually solves the initial value problem.

- How many cells are in the culture after 2.5 hours?

- How many hours does it take for the population of the culture to reach 5,000?